

Instructional Objectives for Topic 7 (Oxidation-Reduction Reactions)

After we conclude Topic 7 in the notes you should be able to do the following:

1. Distinguish between an oxidation and reduction reaction; a reducing and an oxidizing agent.
2. Identify the dominant electron source in soils.
3. In your own words explain how the Nernst equation is used in environmental soil chemistry.
4. Given a table of standard state reduction tables, use the Nernst Equation to create Eh vs. pH diagram.
5. Given the Eh and pH of a natural system, determine the speciation of a particular redox active element using an Eh vs. pH diagram.
6. In your own words explain the concept of pe.
7. Based on the Eh of a system, classify it as oxidizing or reducing.
8. Explain the generalized sequence of redox reactions that will take place when a soil is flooded.
9. Explain why reduced species will exist in a well-oxidized soil and vice versa.
10. List soil implication for redox reactions.
11. Explain the relationship between pH and Eh.
12. Explain the reactions involved with each of the redox couples discussed in class.
13. Explain why field redox measurements are notoriously unreliable.
14. List some examples of surface mediated redox reactions and explain the environmental significance in soils.
15. Explain the chemistry involved with zero-valent iron used as a reducing agent and the associated problems with using it as a remediation technique.
16. Given site specific data for a hazardous waste site, design a remediation technique using a redox process.

17. Based on sorption behavior and oxidation state of trace elements, describe differences on mobility and toxicity in various soils.